

III. "On the Changes in the Gland-Cells of *Dionæa muscipula* during Secretion." By WALTER GARDINER, B.A., Scholar of Clare College, Cambridge. Communicated by W. T. THISELTON-DYER, C.M.G., F.R.S. Received December 18, 1883.

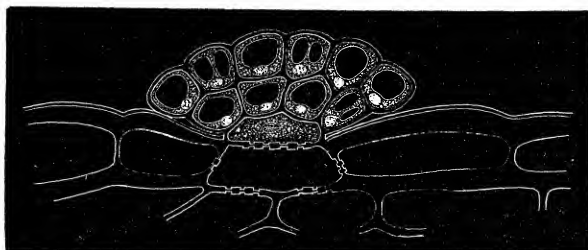
The following observations were made upon leaves of *Dionæa muscipula* which had been fed with the bodies of wood-lice, from which the chitinous coat had been previously removed. The leaves were then placed in absolute alcohol.

It is well known that shortly after the application of animal matter the leaves close, and may remain shut for a period varying usually from ten to twelve days, when they open spontaneously. When, however, the leaf is not vigorous or when the amount of animal matter is somewhat large, the leaf may not open at all, but remain closed until its death.

There appear to be four periods which attend the phenomenon of digestion in such a leaf, viz., the resting, the secretory, and the absorptive periods, and the period of recovery. These periods are fairly well defined in *Dionæa* on account of the slowness with which they proceed.

In the resting state the gland cells (fig. 1) exhibit the following structure:—In each cell, the protoplasm closely surrounds the cell-wall, leaving one large central vacuole, which is filled with the usual pink cell-sap. The protoplasm is extremely granular, especially around the nucleus, which is, in consequence, almost entirely obscured from view. The nucleus is situated at the base of the cell, and is shown by reagents to be large and well-defined.

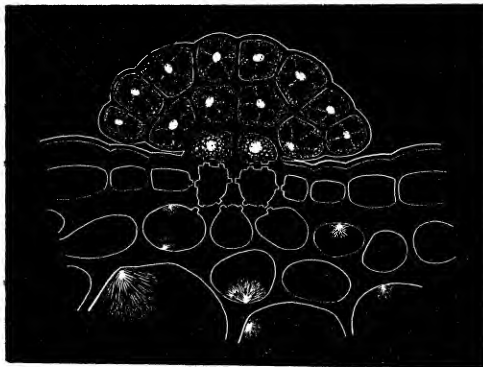
FIG. 1.



At the end of the secreting period, which appears to be about twenty-four hours after stimulation, the following changes have occurred (fig. 2). Movements of the protoplasm have taken place, in consequence of which the nucleus now occupies the centre of the cell; numerous strands of protoplasm radiate from the nucleus to the parietal protoplasm of the cell, in consequence of which several

vacuoles, instead of one large one, are present. The protoplasm now exhibits but little granularity, and may be described as clear and hyaline. The nucleus is clearly brought into view, and appears to have undergone a very considerable diminution in size.

FIG. 2.



Passing to the phenomena of the ordinary leaf tissue, it may be remarked that definite special cell-contents make their appearance after the absorption of the digested food.

Sections of leaves which were placed in alcohol thirty-six hours after feeding, show that the cells contain a very large number of tufts of crystals, which are present in the cell-vacuole and adhere to the inner surface of the cell-protoplasm. The tufts are formed of fine acicular crystals which crystallise out with great regularity and radiate from a central point. The tufts are of a yellow-green colour. They are insoluble in alcohol, in 1 per cent. acetic acid, and in 1 per cent. hydrochloric acid; and soluble with difficulty in 5 per cent. solution of potash. The formation of these crystals may be artificially produced by wetting the surface of a fresh leaf with the fluid from a leaf which has fed for a period of from thirty-six to forty-eight hours.

After forty-eight hours the cell-contents are of a different nature. The cells now contain numerous bodies which present the appearance of flat sphæro-crystals. They are usually perfectly circular in outline, and are clear and colourless. They are insoluble in alcohol but extremely soluble in water.

In *Drosera* the changes take place much more rapidly, the phenomenon of digestion usually extending over a period of from three to five days. The gland-cells in the resting state were seen to be much more granular before, than after secretion. In consequence of absorption the cells contain a large quantity of a substance which is precipitated in dense granules by alcohol, but is readily soluble in water. The author has not yet worked out *Drosera* in detail.

FIG. 1.



FIG. 3.

